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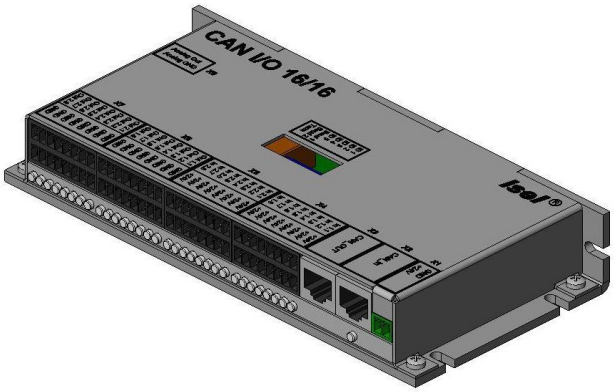
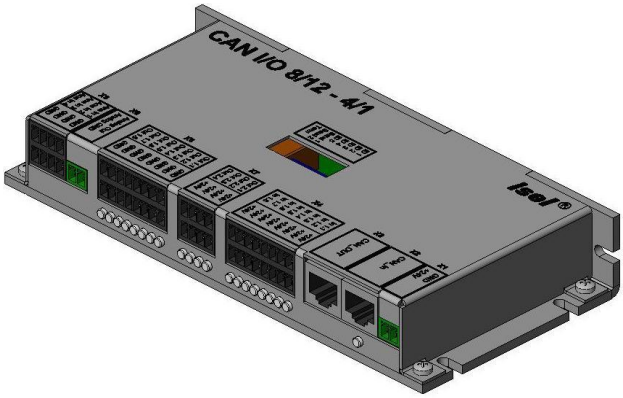


CAN I/O 16/16



CAN I/O 8/12 – 4/1

Operating Instruction

isel - CAN - I/O - Modules

CAN I/O 16/16
CAN I/O 8/12 - 4/1

isel®

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About this manual:

The information, technical data and dimensions contained in this print are up-to-date when published. Any possible misprints and mistakes cannot be excluded however. We are thankful for any suggestion for improvement and indication of mistakes.

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1 Introduction

1.1 General function, benefit in application

The CAN-I/O-Module is an Input/output-module for peripheral automation by linking intelligent modules to the CAN bus (Controller Area Network).

Such modules are:

- Positioning modules for numerical axes, e.g. IMD10, IMD20, IMD40 or CPC12 interface from ***isel* Germany AG**
- HF-Inverter for working spindles
- I/O-Modules for binary (analog) input/output, e.g. CAN-I/O-Modules from ***isel* Germany AG**

All CAN-Modules are intelligent, that means they have at least one microprocessor with integrated on chip or separate CAN-Controller. The CAN-I/O-Modules follow the CANopen- Standard Device profile for I/O-Modules: CiA Draft Standard Proposal DS301 V4.0 und DS401 V2.0.

The **advantages** of using I/O-Modules with CAN interface are:

- The binary (analog) Inputs and Outputs are available close to the process sensors (inputs) as well as to the actuators (outputs). A costly, susceptible and EMC sensitive cabling to the (central) CNC-Controller (CNC-Master, CNC-Control) will be cancelled.

- Additional modules can be integrated and configured in a simply way:

  1. Plug node to CAN-Bus
  2. Set a new node address for the I/O module
  3. Assign the respective software driver (DLL) to the application software (ProNC or Remote)

- There are extensive diagnostic- and test-possibilities because every CAN-I/O-Module is intelligent. That means, that the modules are able to give status and error information to the CNC-Master (this is also the CAN Master) on demand.

1.2 Intended use

The CAN-I/O module is intended to be used as a peripheral Input / Output module and therewith to connect sensors and actuators from an industrial process to this module:

- binary or analog sensors (Inputs)
- binary or analog actuators (Outputs)

1.3 Safety symbols

Danger
This symbol indicates dangers that cause damages for person's health, physical injury or death.

Attention
This Symbol indicates important notes. Ignoring this symbol leads to damages and malfunctions of the module.

Information
This symbol indicates important information and notes.
.

1.4 Safety guidelines

- The CAN-I/O-Modules 16/16 resp. 8/12-4/1 are designed due to current technical and recognized rules.

- Do not expose the device to high humidity or high vibrations.

- Admissible ambient temperature : +5°C bis +40°C
- Storage temperature : –25°C bis +70°C

- The device may only be used if it is in correct condition. Any faults have to be eliminated immediately. Neither children nor non-authorized persons are allowed to put the device into operation.

- The device may only be used for the intended use, i.e. I/O operations.

- All work on the module must be executed from authorized personal regarding electrical industry rules and accident prevention regulations.

- Assembly and use of operating material has to be according to the appointments of **Machinery Directive 2006/42/EU** resp. the **Low Voltage Directive 2006/95/EU**.
  In case of improper, incorrect use even the compliance of the respective rules and standards does not protect against physical damages and damage to property.

- Please take care of the instruction manual. Be sure that all users know the instructions.

- Ignoring the instruction manual can lead to damage, heavy physical damage or to death.

2 Technical specifications

2.1 General, process - and logic power supply

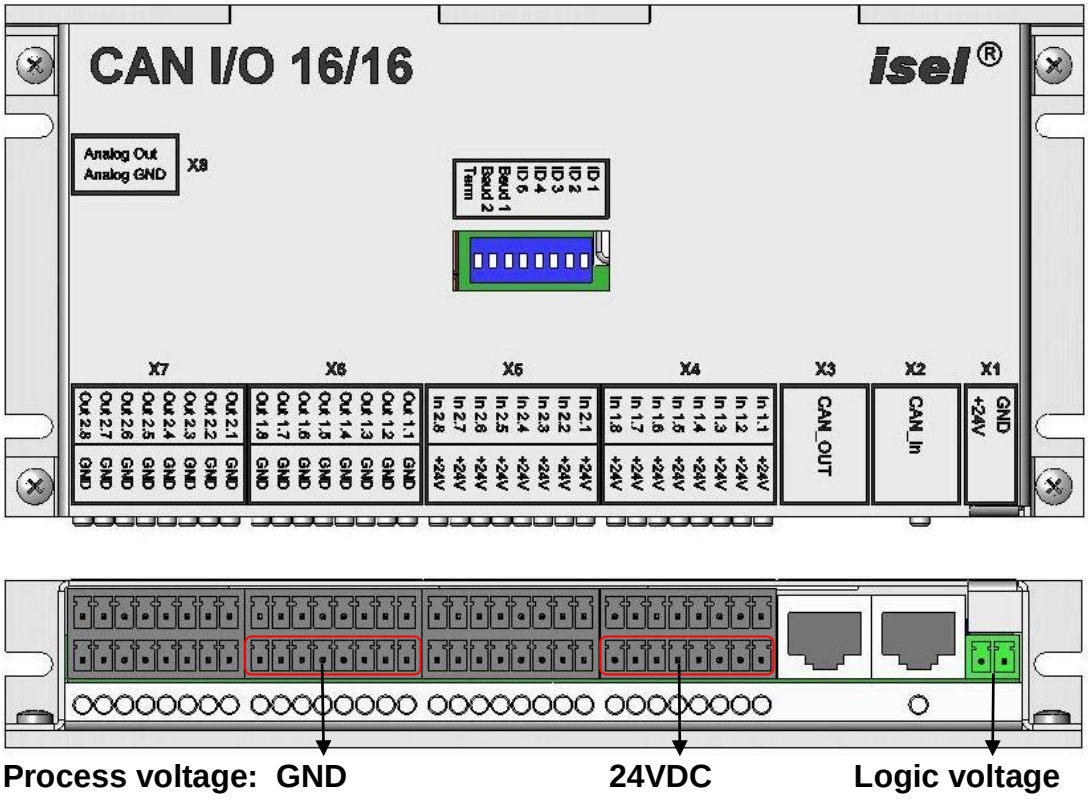
box size:	85mm (B) x 180mm (H) x 28mm (T)
weight:	260 g
safety class:	IP20
power supply 1: (logic voltage)	**24VDC** The logic voltage supplies the module internal logic like the CANopen microcontroller, DA and AD converters, optocouplers, relays and the CAN bus drivers. The logic voltage is feeded to the module via connector X1 from an external 24VDC power supply device.
power supply 2: (process voltage)	**24VDC** The process voltage supplies sensors and actuators that are connected to the CAN-I/O module: • binary process sensors like switches or inductive sensors • binary process actuators like Ohm or inductive loads The process voltage is feeded to the module via connector X4 (+24V) resp. connector X6 (GND) from an external 24VDC power supply device.
power consumption 1: (from / over logic voltage)	160mA
power consumption 2: (from / over process voltage)	 Power consumption (from / over process voltage) depends from the external loads, e.g. especially from the binary process actuators connected to the module. Dimensioning the 24VDC power supply device for process voltage with a sufficient value is very important. The customer is responsible to do this dimensioning correctly.
ambient temperature:	5°C bis +40°C
storage temperature:	-25°C bis +70°C
relative humidity:	max. 95%

CAN – I/O - 16/16	
digital inputs:	16 In1.1 to In1.8 and In2.1 to In2.8 using optocouplers (input current about 8mA)
digital outputs:	16 Out1.1 to Out1.8 and Out2.1 to Out2.8 8 relay outputs Out1.1 to Out1.8, Imax < 5A 8 electronic outputs (switching transistors) Out2.1 to Out2.8, Imax < 350mA, switching delay about 100µs, thermic protection, short-circuit protection
catch diode for digital outputs	Each inductive load plugged to digital outputs requires a separate external catch diode.
analog output:	1 0V – 10V over 8 Bit D/A converter (if the analog output is used the eight electronic digital outputs Out2.1 to Out2.8 can not be used for binary output)
fuse:	630 mA / 250V fast

CAN – I/O - 8/12 - 4/1	
digital inputs:	8 In1.1 to In1.8 using optocouplers (input current about 8mA)
digital outputs:	12 Out1.1 to Out1.8 and Out2.1 to Out2.4 4 relays outputs Out2.1 to Out2.4, Imax < 5A 8 electronic outputs (switching transistors) Out1.1 to Out1.8, Imax < 350mA, switching delay about 100µs, thermic protection, short-circuit protection
catch diode for digital outputs	Each inductive load plugged to digital outputs requires a separate external catch diode.
analog output:	1 0V – 10V over 8Bit D/A transformer
analog inputs:	4 Ana In1 bis Ana In4, 0V – 10V, 16 Bit resolution
fuse:	630mA / 250V fast

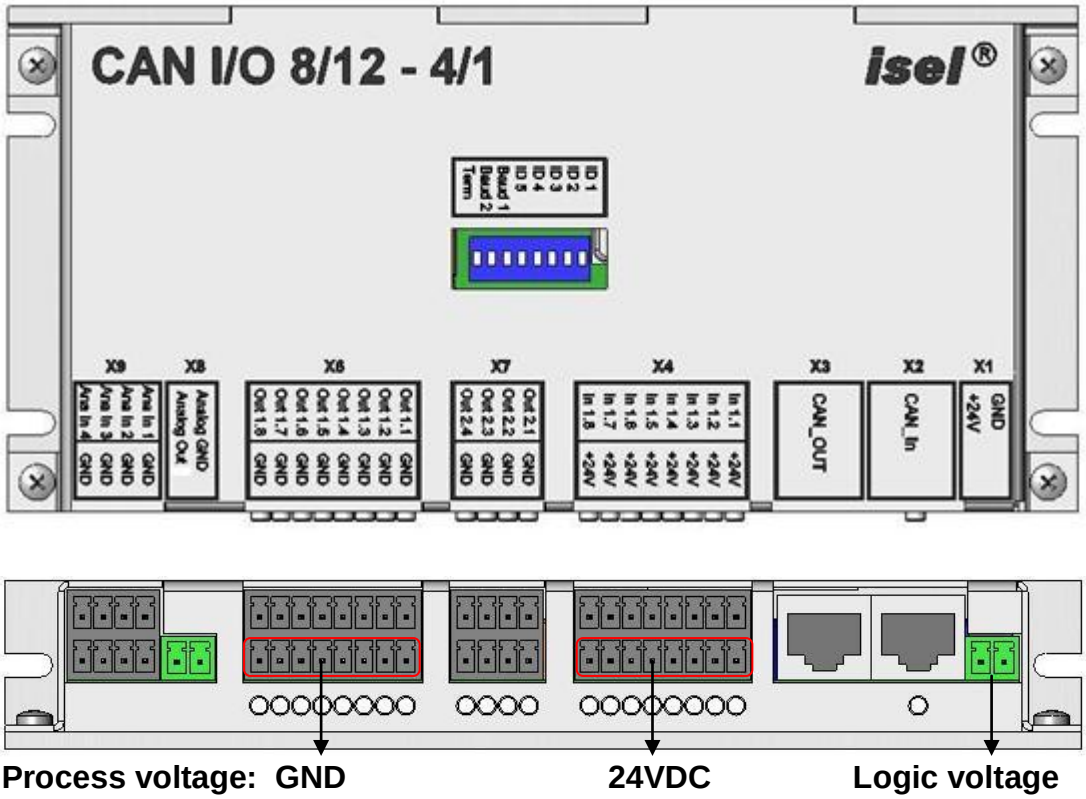
2.2 Module overview

CAN-IO-16/16



Process voltage: GND **24VDC** **Logic voltage**

CAN-IO-8/12- 4/1



Process voltage: GND **24VDC** **Logic voltage**

2.3 Plug allocation

Supply voltage (Logic voltage)

Phoenix Mini Combicon 2 pins

modul	*connector*	*pin*	*signal*	*description*
CAN-IO 16/16	X1	1 2	GND +24V	supply voltage GND supply voltage +24V
CAN-IO 8/12-4/1	X1	1 2	GND +24V	supply voltage GND supply voltage +24V

CAN In, CAN Out

RJ45 connector

modul	*connector*	*pin*	*signal*	*description*
CAN- IO 16/16	X2 CAN In X3 CAN Out	1 2 3 4 5 6 7 8	n.c. n.c. n.c. CAN_H CAN_L CAN_GND n.c. n.c.	not connected not connected not connected signal CAN high signal CAN low GND not connected not connected
CAN-IO 8/12-4/1	X2 CAN In X3 CAN Out	1 2 3 4 5 6 7 8	n.c. n.c. n.c. CAN_H CAN_L CAN_GND n.c. n.c.	not connected not connected not connected signal CAN high Signal CAN low GND not connected not connected

Input ports

Phoenix Mini Combicon 8 x 2 pins

module	*connector*	*pin bottom*	*signal*	*description*
CAN- IO 16/16	X4 In 1 and X5 In 2	1	+24V	
		2	+24V	
		3	+24V	
		4	+24V	
		5	+24V	
		6	+24V	
		7	+24V	
		8	+24V	
		pin top	signal	description
		9	In 1	bit 0
		10	In 2	bit 1
		11	In 3	bit 2
		12	In 4	bit 3
		13	In 5	bit 4
		14	In 6	bit 5
		15	In 7	bit 6
		16	In 8	bit 7
		pin bottom	*signal*	description
CAN-IO 8/12-4/1	X4 In 1	1	+24V	
		2	+24V	
		3	+24V	
		4	+24V	
		5	+24V	
		6	+24V	
		7	+24V	
		8	+24V	
		pin top	signal	description
		9	In 1	bit 0
		10	In 2	bit 1
		11	In 3	bit 2
		12	In 4	bit 3
		13	In 5	bit 4
		14	In 6	bit 5
		15	In 7	bit 6
		16	In 8	bit 7

Output ports

Phoenix Mini Combicon 8 x 2pol.

module	*connector*	*pin bottom*	*signal*	description
CAN- IO 16/16	X6 Out 1	1	GND	
		2	GND	
		3	GND	
		4	GND	
		5	GND	
		6	GND	
		7	GND	
		8	GND	
		pin top	signal	description
	X7 Out 2	9	Out 1	bit 0
		10	Out 2	bit 1
		11	Out 3	bit 2
		12	Out 4	bit 3
		13	Out 5	bit 4
		14	Out 6	bit 5
		15	Out 7	bit 6
		16	Out 8	bit 7
		pin bottom		
CAN-IO 8/12-4/1	X6 Out 1	1	GND	
		2	GND	
		3	GND	
		4	GND	
		5	GND	
		6	GND	
		7	GND	
		8	GND	
		pin top		
	X7 Out 2	9	Out 1	bit 0
		10	Out 2	bit 1
		11	Out 3	bit 2
		12	Out 4	bit 3
		13	Out 5	bit 4 (not on X7)
		14	Out 6	bit 5 (not on X7)
		15	Out 7	bit 6 (not on X7)
		16	Out 8	bit 7 (not on X7)

Analog output

Phoenix Mini Combicon 2 pins

module	*connector*	pin	signal	description
CAN-IO 16/16	X8 AnaOut	1 2	analog Out GND analog Out	reference for analog output analog output (0 – 10V)
CAN-IO 8/12-4/1	X8 AnaOut	1 2	analog Out GND analog Out	reference for analog output analog output (0 – 10V)

Analog inputs

Phoenix Mini Combicon 2 pins

module	*connector*	*pin bottom*	*signal*	*description*
CAN- IO 16/16		-	-	-
		pin bottom	*signal*	*description*
CAN-IO 8/12-4/1	X9 AnaIn	1 2 3 4	GND GND GND GND	reference for analog input 1 reference for analog input 2 reference for analog input 3 reference for analog input 4
		pin top		
		5 6 7 8	Analog In 1 Analog In 2 Analog In 3 Analog In 4	analog input 1 analog input 2 analog input 3 analog input 4

2.4 DIP Switches

The node address of a CAN module is used to clearly identify the device on the CAN bus.

We submit the following assignment of the modules node address:

Module		*Node address*
1. positioning module	→	Node address 1
2. positioning module	→	Node address 2
3. positioning module	→	Node address 3
additional positioning module	→	Node address 4-9
4. I/O-module (firstt)	→	Node address 16
5. I/O-module (second)	→	Node address 17
additional I/O-modules	→	Node address 18 and 19
6. HF- converter	→	Node address 10
additional HF-converter	→	Node address 11,12 or 13

CAN Node address (S1 – S5)

The switches S1 – S5 are used to set the CAN node address. Possible values are 1 to 31.

Node address	*S1*	*S2*	*S3*	*S4*	*S5*
16	off	off	off	off	**on**
17	**on**	off	off	off	**on**
…					
31	**on**	**on**	**on**	**on**	**on**

Baud rate (S6 – S7)

The switches S6 and S7 are used to set the baud rate.

Following values are possible:

Baud rate	*S6*	*S7*
1 MBit/s	off	off
500 kBit/s	on	off
125 kBit/s	off	on
20 kBit/s	on	on

Terminating resistor (S8)

Switch S8 is used to switch a CAN bus termination resistor on or off. If the switch is on a 120 Ω resistor is enabled.

2.5 Assembly, installation, connection

Be sure that the jumper settings are correct before you build in the CAN-I/O module into a Control cabinet or another device (refer to chapter 2.4).

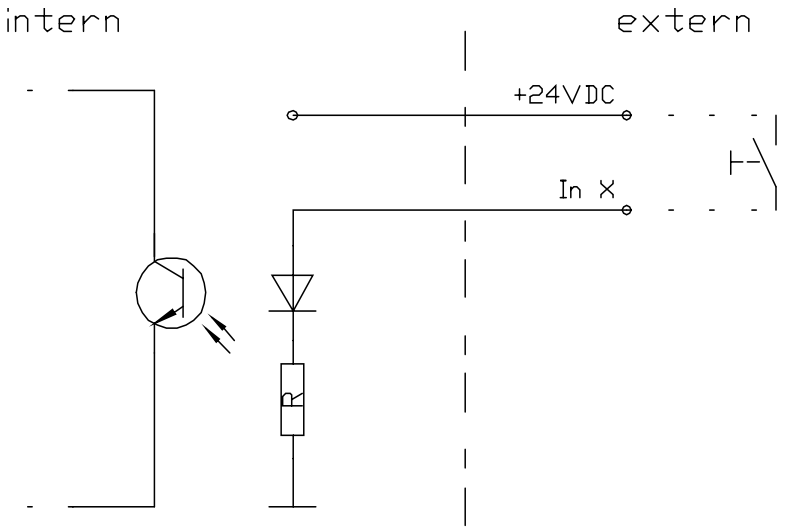
2.5.1 Base connection (Logic voltage and CAN bus)

If you have configured the DIP switches the module can be built in to the intended mounting place.
Now the 24V-power supply (logic voltage) must be connected with X1 (see connection assignment). Also the CAN- bus interface connection must be plugged in (CAN In must be connected)

If the CAN-I/O-module is the last device in the CAN-topology the DIP-switch 8 must be set to “on” to enable the terminating resistor.

2.5.2 Digital inputs

The digital inputs of the CAN-I/O-modules are realized using 24V-DC process voltage. They can be connected to process sensors as follows:

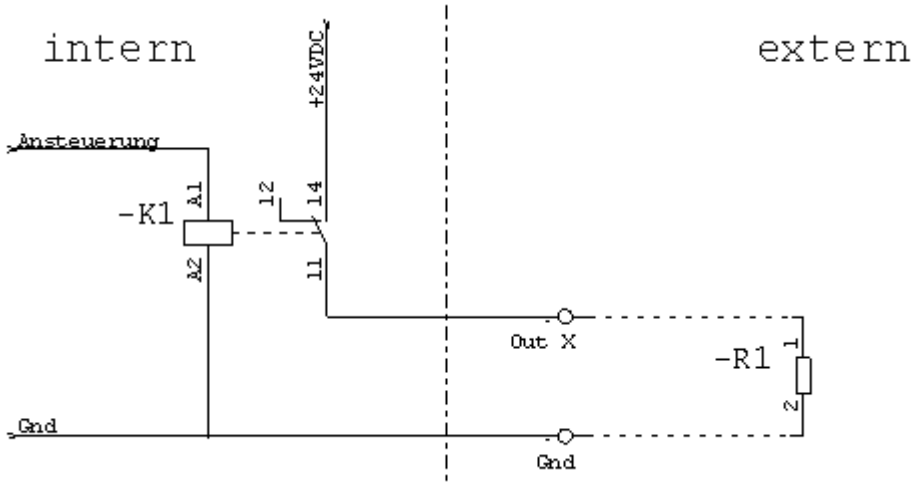


The reference potential (+24VDC, GND) for the external sensor (in the principle drawing a simple switch) is the process voltage.

The input load is about 8mA.

2.5.3 Digital outputs (relay outputs)

The digital relay outputs of the CAN-I/O-modules switch 24V-DC process voltage. Integrate the outputs as follows:



The reference potential (+24VDC, GND) for the external actuator (in the principle drawing a simple resistor) is the process voltage.

The relay outputs

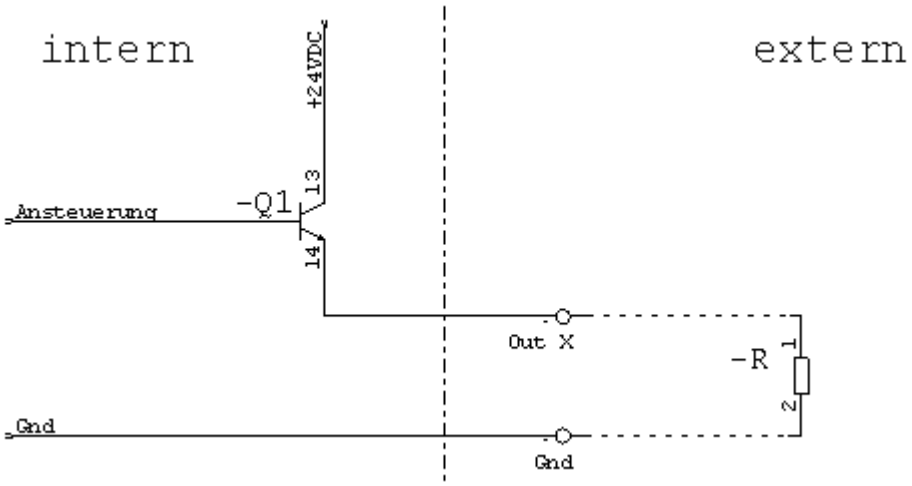
- Out1.1 to Out1.8 at CAN-I/O-Module **CAN-IO 16/16** **= port1 (X6)**
- Out2.1 to Out2.4 at CAN-I/O-Module **CAN-IO 8/12-4/1** **= port2 (X7)**

can be rated with 5A for each output.

Driving inductive loads on digital outputs (for example relays) put parallel to every load (relay) a catch diode (anode to GND).

2.5.4 Digital electronic outputs (switching transistors)

The digital electronic outputs (switching transistors, P channel, 24V switching) of the CAN-I/O-modules switch 24 VDC process voltage. Integrate the outputs as follows:



The reference potential (+24VDC, GND) for the external actuator (in the principle drawing a simple resistor) is the process voltage.

The digital electronic outputs

- Out2.1 to Out2.8 at CAN-I/O-Module **CAN-IO 16/16** **= port2 (X7)**
- Out1.1 to Out1.8 at CAN-I/O-Module **CAN-IO 8/12-4/1** **= port1 (X6)**

can be loaded with max. 350mA on each output.

IMPORTANT when using the CAN-I/O-Module **CAN-IO 16/16,**
here obtains for digital electronic outputs Out2.1 bis Out2.8 = Port2 (X7):

If the integrated D/A converter is used for analog output then port2 is reserved. That means port2 is not longer available for digital outputs. To prevent confusions you can deactivate port2 by removing Jumper1 (refer the next chapter **Analog output**). Through this the port2 LEDs are also deactivated.

Driving inductive loads on digital outputs (for example relays) put parallel to every load (relay) a catch diode (anode to GND).

2.5.5 Analog output

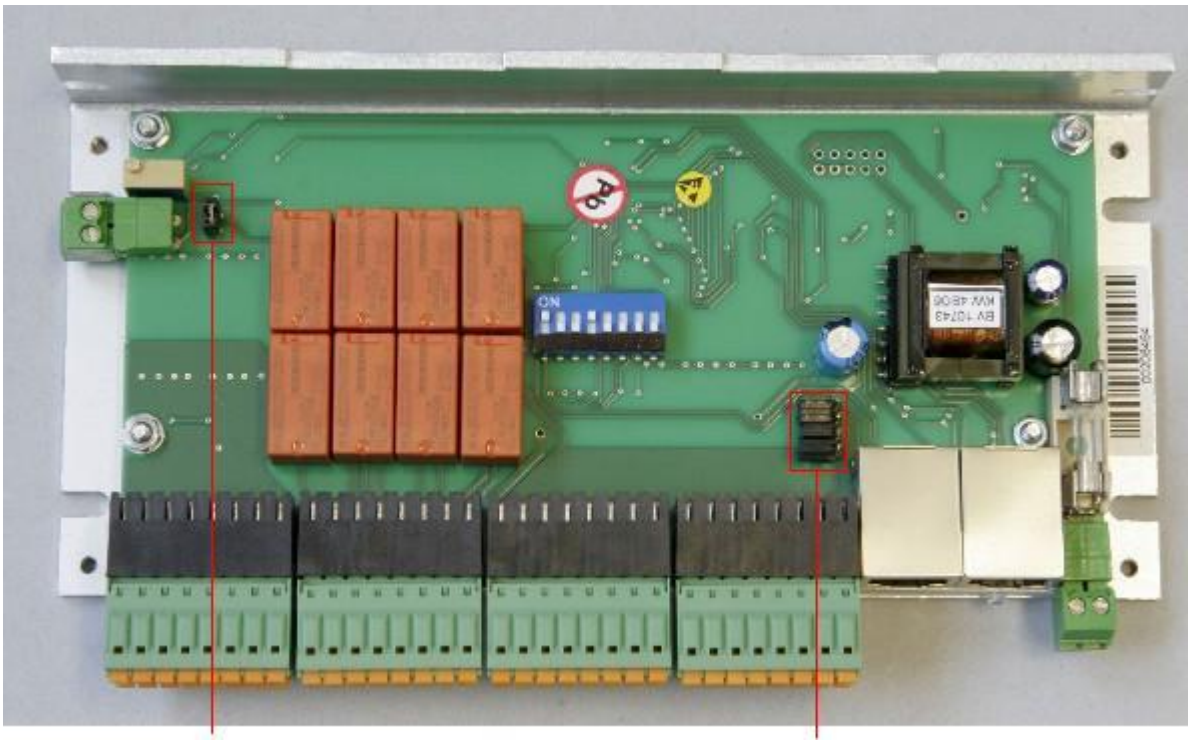
You can use this output for controlling an external device with 0 to 10V interface / input (e.g. the target velocity for HF converter).

If the analog output ist used, port2 is no longer available for digital outputs.

info

Output current not more than 15mA!

CAN-I/O 16/16 Jumper settings



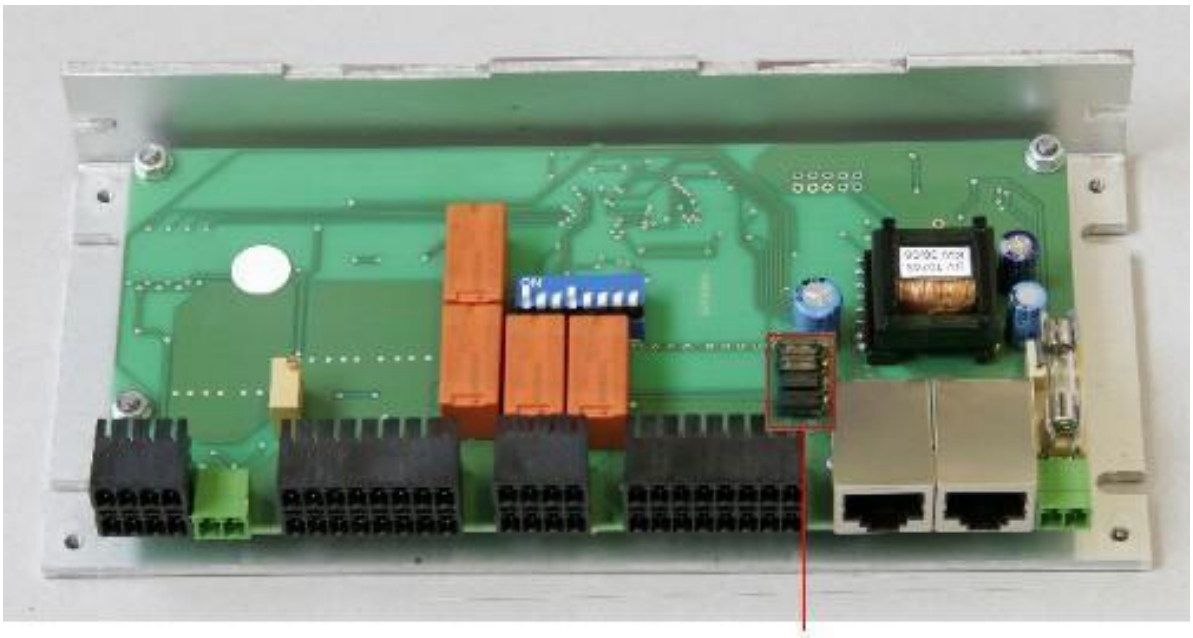
Jumper 1 plugged:
- if the analog output is in use the LEDs from output Port A2 signalize the binary analog output value.

Delivery state:
Jumper 2 (4 pieces) not plugged. Galvanic separation the 24DCV process voltage from 24VDC logic voltage is guaranteed.

If you plug the jumpers 2 then there is no galvanic separation between 24VDC process voltage and 24VDC logic voltage!

This may be effects damages on the CAN-I/O-Module.

CAN-I/O 8/12 - 4/1 Jumper settings



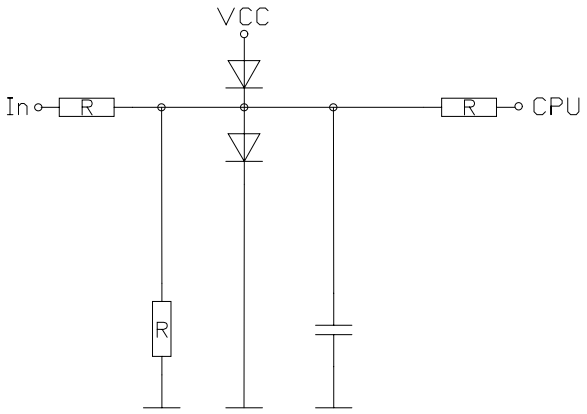
Delivery state: **Jumper 1** (4 pieces)
Jumper 1 is not plugged. Galvanic separation the 24VDC process voltage from 24VDC logic voltage is guaranteed.

If you plug the jumper 1 then there is no galvanic separation between 24VDC process voltage and 24VDC logic voltage!

This may be effects damages on the CAN-I/O-Module

2.5.6 Analog input

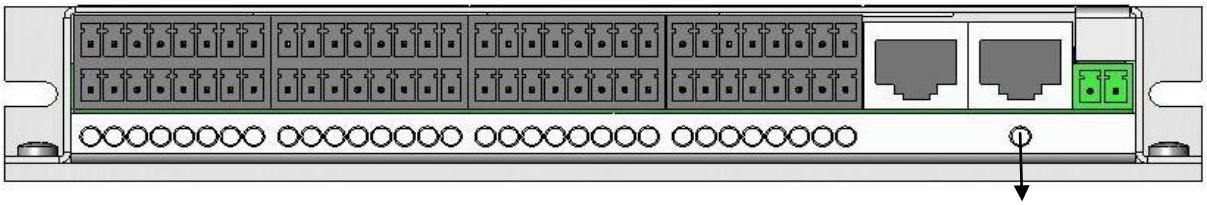
The module CAN-I/O-8/12-4/1 has 4 analog Inputs with an input voltage range from 0V to10V and a resolution of 16 Bit. On these inputs you can directly connect e.g. sensors. These inputs have an input impedance of 2kΩ and provides an internal RC filter.



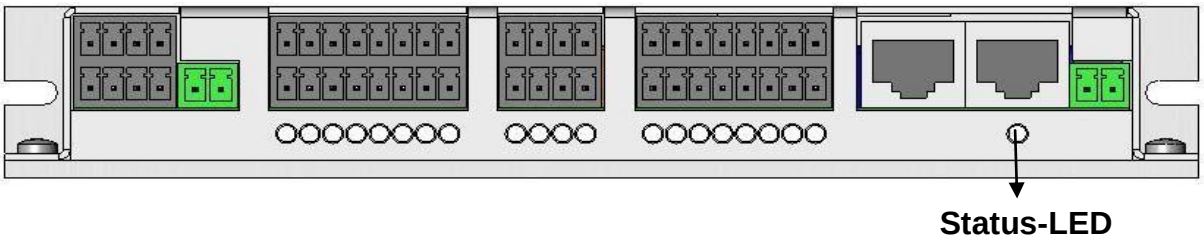
2.5.7 Diagnosis, signalization, fault states

Diagnosis of the CAN-I/O modules is possible by observing the status LED.

CAN-IO-16/16



CAN-IO-8/12- 4/1



This LED signals 4 different states:

LED duty cycle	*State*
0%, off	Error: CAN I/O module is not in operational state, logic voltage is not available or the internal power supply (DC/DC: 24 VDC to 5,0 V) is damaged
10%	No error → normal operation
50%	Uncritical error or warning
90%	Critical error (NMT error, output error)

3 Integration into the control software (ProNC, Remote)

3.1 Settings in the module management

At first the Interface-DLL which opens the connection between ProNC/Remote and CAN-IO-Device must be set-up.

If not already available, copy the files

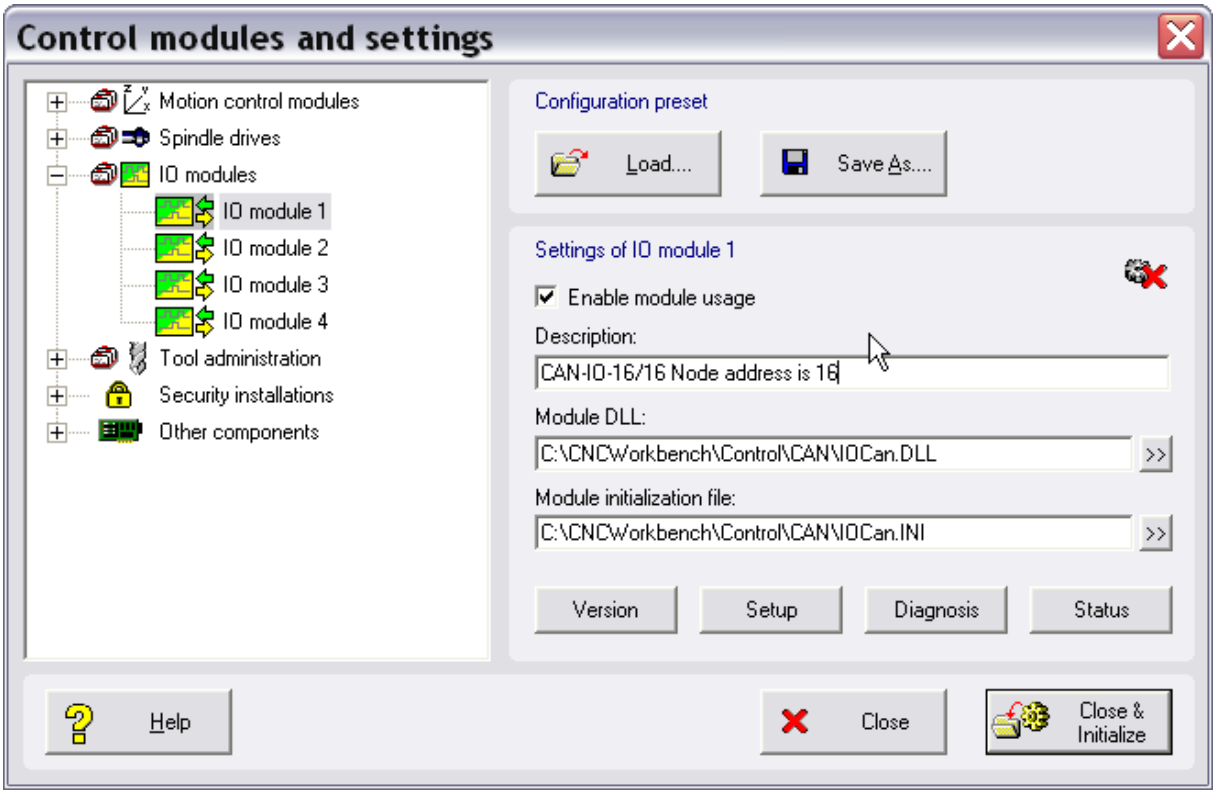
IoCan.DLL
and
IoCan.INI

into a new sub-directory of the CNCworkbench - directory.

Our suggestion for the new directory:

{ProgramPath}\CNCWorkbench\Control\Can

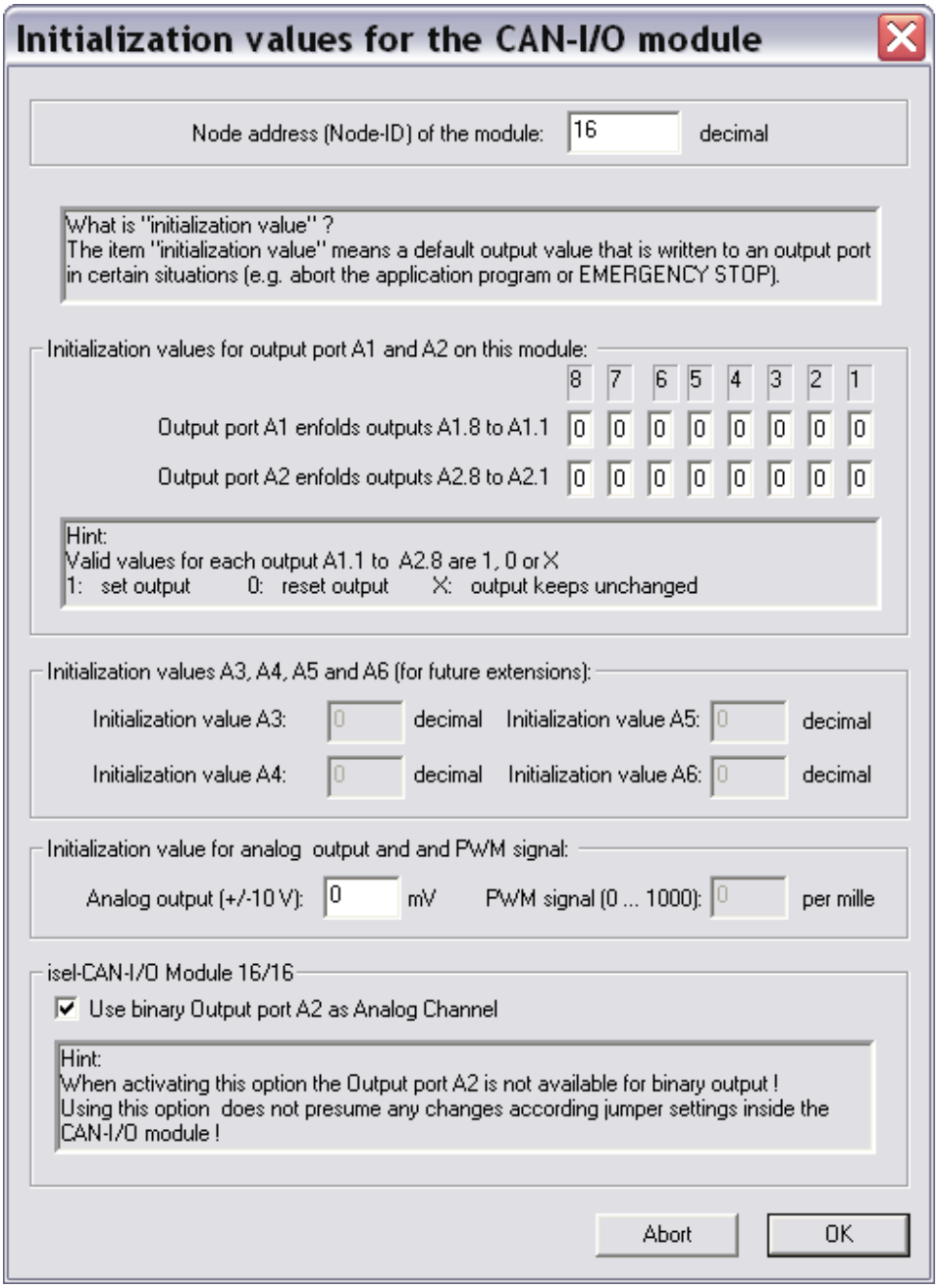
After the files are copied the application must get to know the new IO-device- Therefore start ProNC/Remote and open the Setup-dialog for the control with the help of the command "Setup – Control…". The following dialog will be appear:



Follow the commands to get the USB-IO device into the modul management:

- Choose in the tree view the IO-Modul which is not in use and name it e.g”CAN-IO-16/16 Node address is 16" or only "CAN IO".
- Click on ">>" next to the Edit field "Modul DLL". Choose the "IoCan.DLL" in the "\CNCWorkbench\Control\Can" directory. The Edit field "Modul initialisation file" shows automatically the “CNCWorkbench\Control\Can\IoCan.INI" file. You don’t need to rename the file.
- Click on button Setup (in case nothing will happen, choose another IO-Modul from the tree view and after that choose the IO-Modul for the CAN-IO).

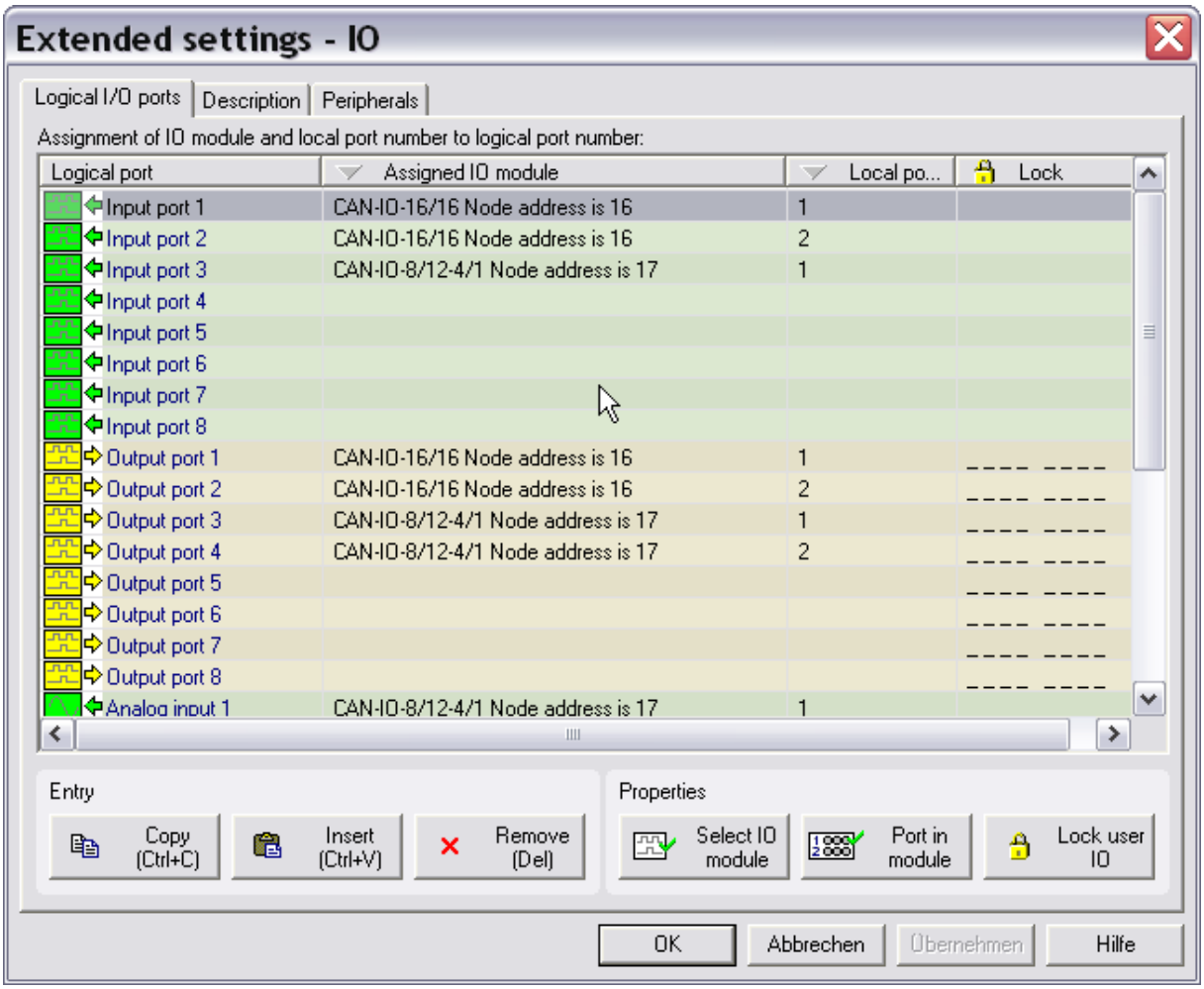
  Click on Setup to open the Setup dialog.


Initialization values for the CAN-I/O module
Node address (Node-ID) of the module: 16 decimal
What is "initialization value" ?
The item "initialization value" means a default output value that is written to an output port in certain situations (e.g. abort the application program or EMERGENCY STOP).
Initialization values for output port A1 and A2 on this module:
8 7 6 5 4 3 2 1
Output port A1 enfolds outputs A1.8 to A1.1 0 0 0 0 0 0 0 0
Output port A2 enfolds outputs A2.8 to A2.1 0 0 0 0 0 0 0 0
Hint:
Valid values for each output A1.1 to A2.8 are 1, 0 or X
1: set output 0: reset output X: output keeps unchanged
Initialization values A3, A4, A5 and A6 (for future extensions):
Initialization value A3: 0 decimal
Initialization value A5: 0 decimal
Initialization value A4: 0 decimal
Initialization value A6: 0 decimal
Initialization value for analog output and and PWM signal:
Analog output (+/-10 V): 0 mV
PWM signal (0 ... 1000): 0 per mille
isel-CAN-I/O Module 16/16
Use binary Output port A2 as Analog Channel
Hint:
When activating this option the Output port A2 is not available for binary output !
Using this option does not presume any changes according jumper settings inside the CAN-I/O module !
Abort
OK

In this dialog you can set different settings for the module. The most important setting are the node address of the module. The default value for the address is 16. Furthermore you can set initialization values for digital and analog output ports. If you start the software (ProNC / Remote) these values will be set.

3.2 Settings within the Contro administration

To get access to the IO-module within the Control administration one setting in the top level must be changed. Open the "Extended settings-IO" - Dialog as follows. Highlight in the tree structure "IO modules". Click on Extended settings on the right side. You can see the following dialog:

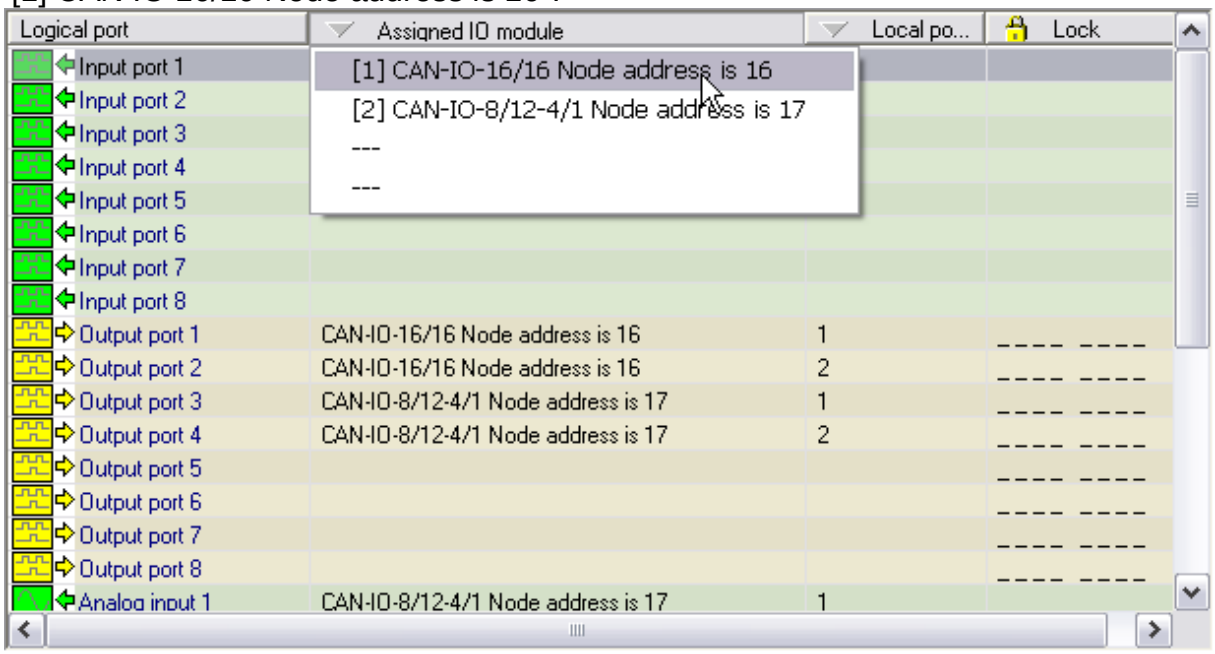


The IO-module " CAN-IO-16/16 Node address is 16" needs a logical Input / Output port number to access the Input / Output-functions from the CNC control software ProNC resp. Remote.

Mind the following notes:

- Highlight a free logical port, for example: Input port 1
- Choose in the button band

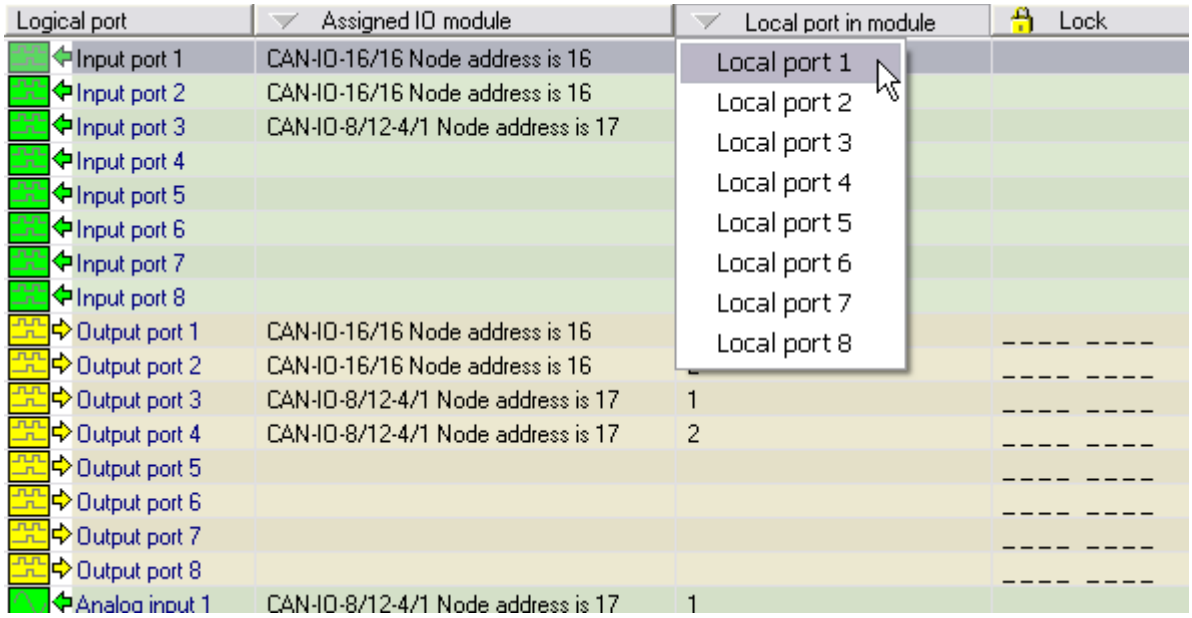
the button "▼Assigned IO module" by mouse click, then the element "[1] CAN IO 16/16 Node address is 16":


Logical port
Assigned IO module
Local po...
Lock
[1] CAN-IO-16/16 Node address is 16
[2] CAN-IO-8/12-4/1 Node address is 17

Input port 1
Input port 2
Input port 3
Input port 4
Input port 5
Input port 6
Input port 7
Input port 8
Output port 1 CAN-IO-16/16 Node address is 16 1
Output port 2 CAN-IO-16/16 Node address is 16 2
Output port 3 CAN-IO-8/12-4/1 Node address is 17 1
Output port 4 CAN-IO-8/12-4/1 Node address is 17 2
Output port 5
Output port 6
Output port 7
Output port 8
Analog input 1 CAN-IO-8/12-4/1 Node address is 17 1

- Choose in the button band

the button "▼ Local port in module" by mouse click, then the element "Local Port 1":


Logical port
Assigned IO module
Local port in module
Lock
Local port 1
Local port 2
Local port 3
Local port 4
Local port 5
Local port 6
Local port 7
Local port 8
Input port 1 CAN-IO-16/16 Node address is 16
Input port 2 CAN-IO-16/16 Node address is 16
Input port 3 CAN-IO-8/12-4/1 Node address is 17
Input port 4
Input port 5
Input port 6
Input port 7
Input port 8
Output port 1 CAN-IO-16/16 Node address is 16
Output port 2 CAN-IO-16/16 Node address is 16
Output port 3 CAN-IO-8/12-4/1 Node address is 17 1
Output port 4 CAN-IO-8/12-4/1 Node address is 17 2
Output port 5
Output port 6
Output port 7
Output port 8
Analog input 1 CAN-IO-8/12-4/1 Node address is 17 1

- Click on "OK" to close the dialog

Now you must do the described steps for all logical output ports, analog output and analog input. You find these entries by scrolling down in the list field.

Close the dialog "Control modules and settings" over the button "Close & Initialize" to reinitialize the new modules.

The following lines show the use of local input ports, output ports, analog output and analog input of the different modules.

CAN- IO- 16/16

Local input ports: Port 1 and Port 2
Local output ports: Port 1 and Port 2

Local analog output: Port 1 (alternatively with the local output port Port 2)

If the analog output is used, Port 2 (X7) is no longer available for digital outputs. You must clear the entry for this port in the list.

CAN- IO- 8/12- 4/1

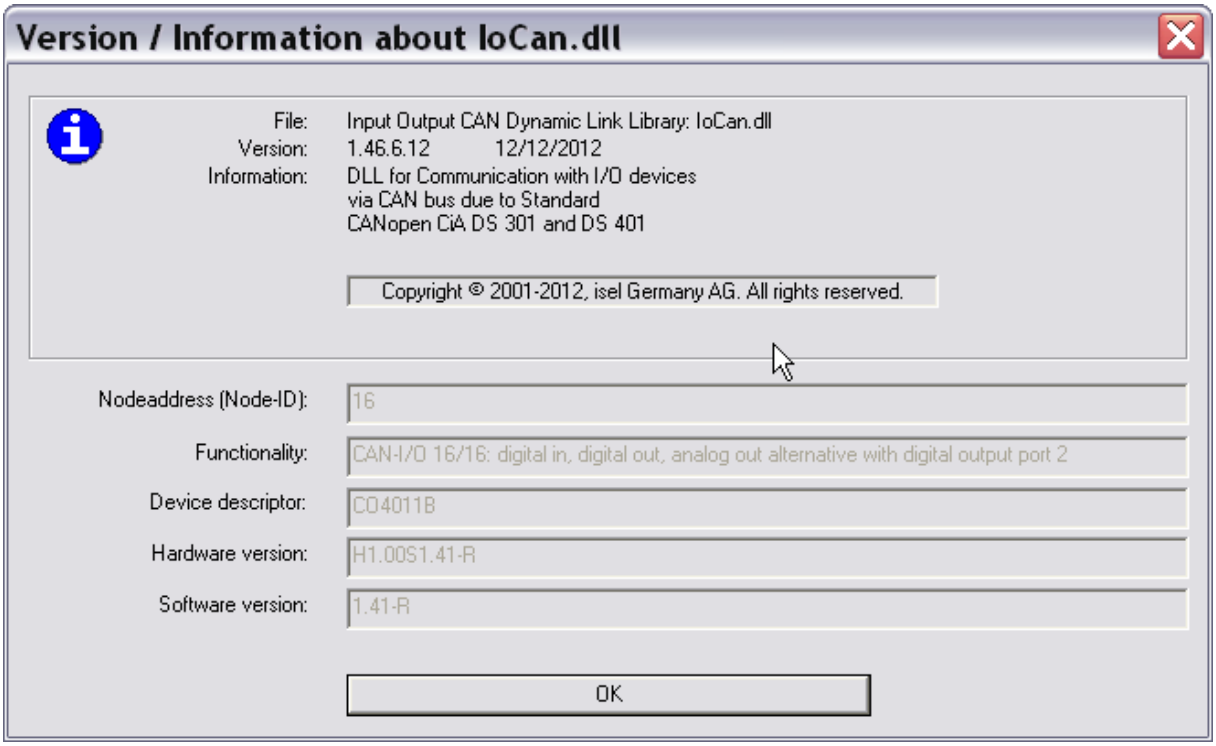
Local input ports: Port 1
Local output ports: Port 1 and Port 2

Local analog output: Port 1
Local analog inputs: Port 1 - Port 4

At the local output port 2 you can only use the outputs 1-4:

A2.1 = Out 2.1
A2.2 = Out 2.2
A2.3 = Out 2.3
A2.4 = Out 2.4

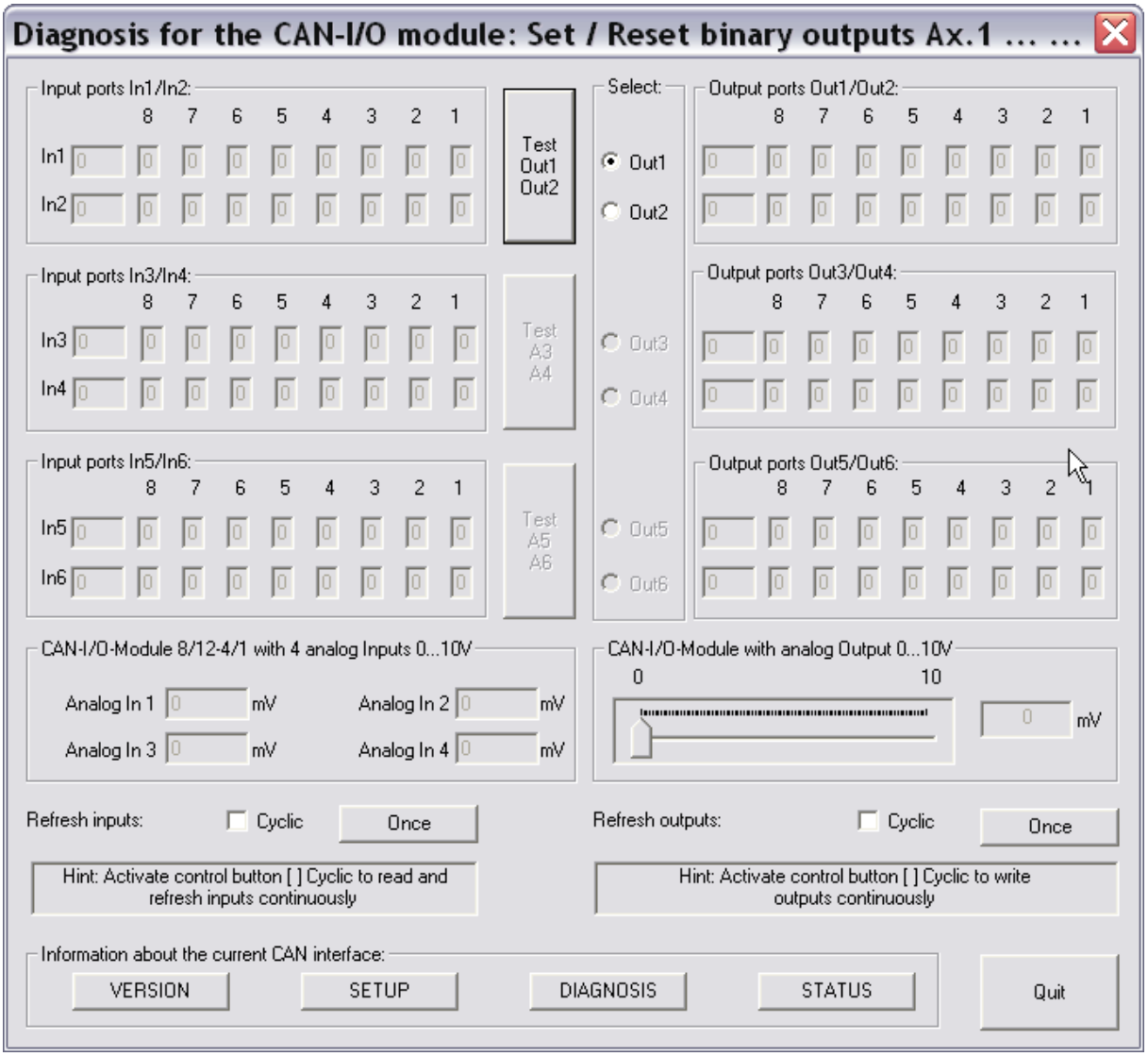
3.3 Version information



Inside the module management you can show version information of the used module DLL and the connected device type by pressing the button Version .

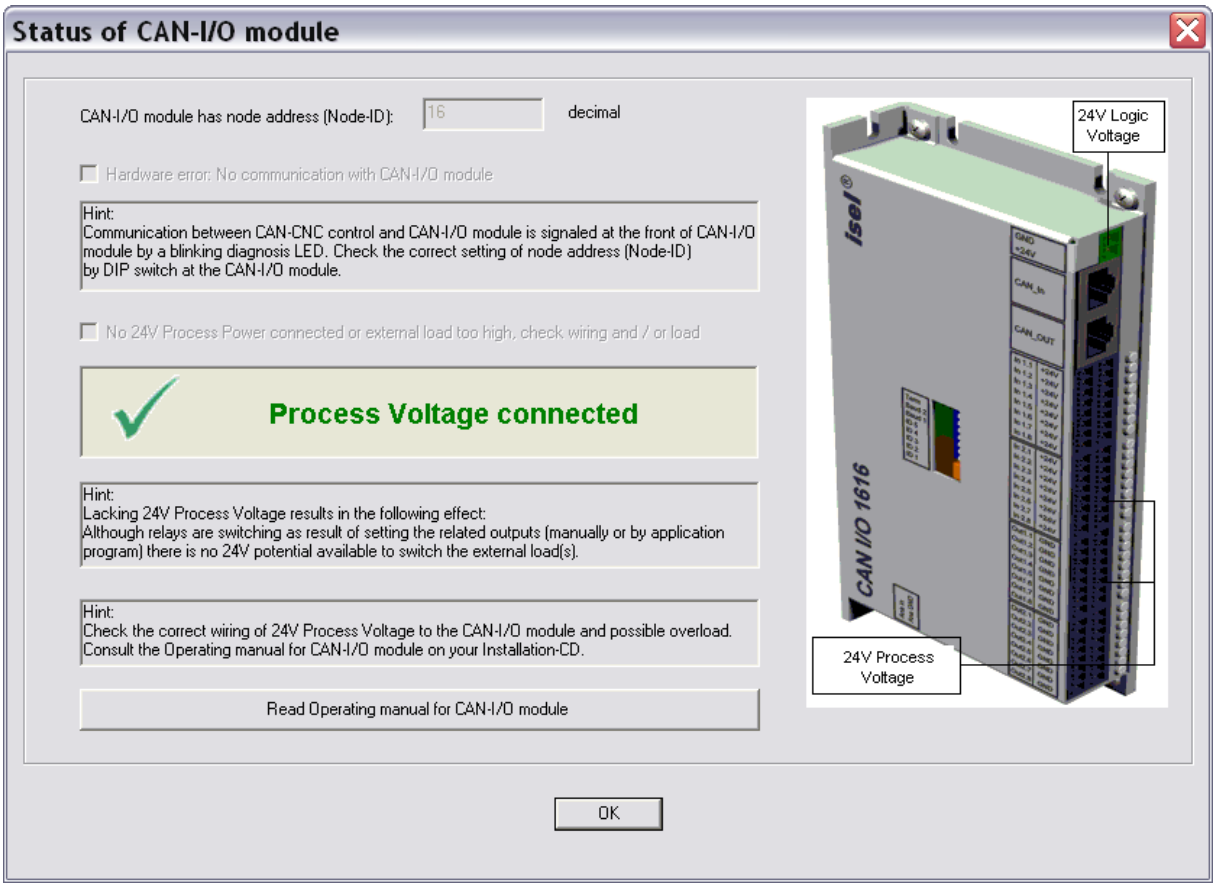
3.4 Diagnosis function

The button Diagnosis allows you to access input / output functions of the connected CAN-I/O-module. In this dialog you can e.g. switch outputs separately or you can check the state of inputs.



3.5 Status information

Using the button Status you can check whether the process voltage is connected to the CAN I/O module.


Status of CAN-I/O module
CAN-I/O module has node address (Node-ID):
16
decimal
Hardware error: No communication with CAN-I/O module
Hint:
Communication between CAN-CNC control and CAN-I/O module is signaled at the front of CAN-I/O module by a blinking diagnosis LED. Check the correct setting of node address (Node-ID) by DIP switch at the CAN-I/O module.
No 24V Process Power connected or external load too high, check wiring and / or load
Process Voltage connected
Hint:
Lacking 24V Process Voltage results in the following effect:
Although relays are switching as result of setting the related outputs (manually or by application program) there is no 24V potential available to switch the external load(s).
Hint:
Check the correct wiring of 24V Process Voltage to the CAN-I/O module and possible overload.
Consult the Operating manual for CAN-I/O module on your Installation-CD.
Read Operating manual for CAN-I/O module
OK
24V Logic Voltage
24V Process Voltage
isel
CAN I/O 1616

If there is no process voltage connected to the CAN I/O module you can not measure 24VDC potential between the load connectors X4 (24VDC) and X6 (GND).

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